Patent Claims

1. Aqueous concentrate stable on freezing and thawing and containing at least one water-soluble or water-dispersible copper compound and optionally also a water-soluble or water-dispersible tin compound, for use in the diluted state as a bath for the currentless coppering or bronzing of objects, in particular metallic objects such as for example iron or steel wires, characterised in that the concentrate contains at least one complexed water-soluble or water-dispersed copper compound.

2. Aqueous concentrate according to claim 1, characterised in that at least 40 wt.% of the contained copper compounds are complexed.

3. Aqueous concentrate according to claim 1 or 2, characterised in that the at least one copper compound is at least partially complexed with a complex-forming agent based on at least one complexing monohydroxycarboxylic, dihydroxycarboxylic, trihydroxycarboxylic and/or polyhydroxycarboxylic acid and/or at least one of their derivatives.

4. Aqueous concentrate according to one of the preceding claims, characterised in that it is stable to freezing and thawing down to at least -8°C.

5. Aqueous concentrate according to one of the preceding claims, characterised in that it has a copper content in the range from 3 to 200 g/l Cu.

6. Aqueous concentrate according to one of the preceding claims, characterised in that it is adjusted to a pH value in the range from 4 to 11.

7. Aqueous concentrate according to one of the preceding claims, characterised in that the at least one copper compound is at least partially complexed with a complexing agent based on at least one monohydroxycarboxylic, dihydroxycarboxylic, trihydroxycarboxylic and/or polyhydroxycarboxylic acid, phosphonic acid, diphosphonic acid and/or at least one of their derivatives.

8. Aqueous bath containing at least one water-soluble or water-dispersible copper compound and optionally also a water-soluble or water-dispersible tin compound, for the currentless coppering or bronzing of objects, in particular metallic objects such as for example iron-containing wires, characterised in that the bath contains at least one complexed copper compound and at least one brightening agent, and that it is adjusted to a pH value of less than 2.5.

9. Aqueous bath according to claim 8, characterised in that at least 40 wt.% of the contained copper compounds are complexed.

10. Aqueous bath according to claim 8 or 9, characterised in that it has a copper content in the range from 0.05 to 120 g/l.

11. Aqueous bath according to one of claims 8 to 10, characterised in that the iron content of the bath is up to at least 90 or even up to at least 110 g/l Fe^{2+}.

12. Aqueous bath according to one of claims 8 to 11, characterised in that the at least one copper compound is a compound that is at least partially complexed with a complex-forming agent based on at least one complexing monohydroxycarboxylic, dihydroxycarboxylic, trihydroxycarboxylic and/or polyhydroxycarboxylic acid, phosphonic acid, diphosphonic acid and/or at least one of their derivatives.

13. Aqueous bath according to one of claims 8 to 12, characterised in that it has a content of reacted or unreacted complex-forming agent in the range from 0.1 to 400 g/l, calculated as unreacted complex-forming agent.

14. Aqueous bath according to one of claims 8 to 13, characterised in that it has a content of at least one brightening agent, in particular a brightening agent containing amide, amine, imide, imine, polymeric amino alcohol, polyamide, polyamine, polyimide, polyimidazoline and/or polyimine.

15. Aqueous bath according to one of claims 8 to 14, characterised in that it has a content of at least one brightening agent in the range from 0.05 to 20 g/l.

16. Aqueous bath according to one of claims 8 to 15, characterised in that it has a content of at least one pickling agent, in particular at least one halide of an alkali metal, alkaline earth metal and/or

ammonium and/or at least one acid, in particular at least one mineral acid.

17. Aqueous bath according to one of claims 8 to 16, characterised in that it has a pH value in the range below 2.5.

18. Aqueous bath according to one of claims 8 to 17, characterised in that it contains at least one lubricating additive that is water-soluble and/or water-dispersible, and/or that permits the deposition of at least one lubricating additive during coppering or bronzing.

19. Aqueous bath according to one of claims 8 to 18, characterised in that it is stable to freezing and thawing down to at least -8°C.

20. Process for the currentless coppering or bronzing of an object, in particular a metallic object, especially an object of a ferrous material, above all an iron wire or steel wire or a wire-containing assembly such as for example a wire mesh, using an aqueous bath according to one of claims 8 to 19, characterised in that a concentrate according to one of claims 1 to 7 is prepared for use and diluted by the addition of water and if necessary of in each case at least one acid, salt, brightening agent, pickling agent and/or a further additive to the ready-for-use aqueous bath for the coppering or bronzing.

21. Process for the currentless coppering or bronzing of an object according to claim 20, characterised in

that the pH value of the bath is adjusted to values of around or less than 1.0 and is maintained in this range.

22. Process for the currentless coppering or bronzing of an object according to claim 20 or 21, characterised in that the object to be metallised is brought into contact with the bath liquid for a time ranging from 0.1 to 8 minutes in the case of dipping and for a time ranging from 0.1 to 30 seconds in the case of throughflow metallising.

23. Process for the currentless coppering or bronzing of an object according to one of claims 20 to 22, characterised in that metallising is carried out at a bath temperature in the range from 5° to 80°C.

24. Process for the currentless coppering or bronzing of an object according to one of claims 20 to 23, characterised in that a coating with a copper content of 0.1 to 40 g/m^2 is applied.

25. Process for the currentless coppering or bronzing of an object according to one of claims 20 to 24, characterised in that metallising is also carried out with an iron content in the bath of up to 90 or even up to 110 g/l Fe^{2+}.

26. Process for the currentless coppering or bronzing of an object according to one of claims 20 to 25, characterised in that the metallic object to be metallised is, before being contacted with the bath solution, first of all cleaned under alkaline conditions in a currentless and/or electrolytic

process and/or is pickled under acidic conditions and is then optionally also rinsed with water.

27. Process for the currentless coppering or bronzing of an object according to one of claims 20 to 26, characterised in that the metallised object is then rinsed, optionally dried, optionally treated with a passivating agent and optionally re-rinsed, optionally annealed and, in the case of wires, optionally also drawn at least once.